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Y2K'S IMPACT ON THE U.S. AIR FORCE

by

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Preface

I chose the Y2K problem as my research topic for several reasons. First, many Air Force systems are computer driven or computer dependent and I wanted to know what kind of difficulties we can expect in the coming year. Second, the Y2K problem has occupied an inordinate amount of personnel and resources in my career field of communications and computers and I wanted to see how these resources were being expended. And finally, an entire cottage industry has sprung up predicting doom and gloom for the world come 1 January 2000 and I wanted to determine if the predictions were accurate or simply the rantings of a group of Chicken Littles.

I would like to thank several people for all the help they gave me while gathering my research for this paper: Major Anthony Gould, Air Command and Staff College, without whose help, guidance (and occasional push) I never would have completed this paper. CAPT Thomas Quigley, National Reconnaissance Office, who pointed me in the right direction when I kept losing my way. Lt Col Scott Dufaud, Air Force Communications Agency, whose support and reams of information turned out to be the heart and soul of my research. Major Michael Babauta, National Reconnaissance Office, who believed in me even when I doubted myself and who made sure I got the information I needed when I needed it. And last but by no means least, my wife Kim and boys Glenn and Jonathan who kept me focused during this year and provided me something to look forward to when all of this over—going back to a loving family.

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Abstract

The United States Air Force can expect to encounter many difficulties directly attributable to the Y2K problem but the majority of them will most likely be minor not catastrophic in nature. The expected impact of the Y2K problem on the US Air Force is determined by examining the areas projected to be most severely impacted, reviewing Y2K correction efforts, and reading the opinions/predictions of the foremost experts in the field of Y2K testing and validation. The majority of the information is gleaned from the internet, tech journals and correspondence with experts. The writer examines which major Air Force systems will be impacted by Y2K to include examining the status of the 3500 systems currently being tracked by the USAF Y2K Program Management Office. The impacts of Y2K on the Air Force in areas such as cost and personnel are also explored. Finally, the writer concludes the Y2K problem will cost the USAF in excess of $1 billion but all mission critical systems will be tested and validated by 31 December 1999. However, some civilian electrical, water and transportation systems will suffer set backs due toY2K and the Air Force's dependency on these systems will disrupt, albeit slightly, the Air Force's ability to carry out its mission.

Chapter 1

Definition of the Y2K Issue

The Air Force is arguably the most technologically dependent component of the United States armed forces. Our ability to exploit air and space across the spectrum of conflict relies heavily on computer-based systems. To ensure we maintain information superiority into the 21st century, we must attack and resolve the Year 2000 problem in Air Force systems. Fixing the Year 2000 problem is the Air Force's top software sustainment issue.

— Secretary of the Air Force Sheila E. Widnall
— Air Force Chief of Staff General Ronald R. Fogleman [1]
24 June 1997

Source of the Problem

The Y2K problem is a direct result of early computer programmers trying to save money and memory by shortening the date field in their software. During the early years of computing memory was very expensive so computer programmers used many programming tricks in order to save as much memory as possible. One of the most common tricks they used was to delete the first two digits in the "year" date field (e.g. 1966 became simply 66). Because of the need for date fields throughout many different programs, such as when bills are paid, goods are shipped, or materials are requisitioned, this simple programming trick could save a company millions of dollars across many computers. Unfortunately, even when computer memory became inexpensive, programmers continued to use the two-digit date field, either out of habit or laziness.[2]

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But, because many computer programs assume the first two digits in the "year" date field to be "19", when the year 2000 arrives those programs are either going to think it is 1900 or not recognize the data at all.

As simple as it sounds that one little computing trick is the root cause of the year 2000 computing problem (a.k.a. Y2K or the Millennium Bug). Unfortunately, we do not know all of the programs that are affected by this problem nor do we know how those programs will react when January 2000 arrives. We do not even know what the fallout from the various computer failures will be. We do know, however, there will be problems. It is only the size and the scope of those problems that remain undetermined.

Every major industry from agriculture to manufacturing depends upon computers. This dependency will result in the expenditure of more that $1 trillion dollars and millions of man-hours debugging and testing various computer systems. Although some in the computer industry began warning of the dangers of Y2K back in the early 1980's it has only been in the last five years that significant efforts have been taken to prevent major problems from occurring. However, despite this huge effort we know that some computers are going to fail to perform their primary functions at the beginning of next year.

So, what might occur? The problems could start with the mundane- elevators stopping because they think they have not had a safety inspection in more than 100 years. Then comes the inconvenience of such things as automated teller machines not working. Next are the troublesome and potentially dangerous- traffic lights failing. Finally, the catastrophic- major U.S. defense systems reacting in an unpredictable manner.[3]

Fortunately, federal, state and local governments along with major corporations have been working to minimize the impact of Y2K. Websites describing the efforts of the various levels of government can be found at www.washingtonpost.com/wp-srv/washtech/longterm/y2k/links.htm.   Unfortunately, because of the sheer number of systems to be checked and the resources available to check them it is a mathematical certainty that some problems will not be detected and corrected by the deadline. However, most organizations have prioritized their systems and will continue to work to make their critical systems Y2K compliant. This is important because they realize those systems not tested and corrected by the deadline are the ones that are most likely to fail.

Notes

[1] Sheila E. Widnall, Secretary of the Air Force, General Ronald R. Fogleman, Chief of Staff of the Air Force, *MEMORANDUM FOR ALMAJCOM-FOA, SUBJECT: Year 2000 Problem*, 24 June 1997

[2]"The Basics of Y2K." The Christian Science Broadcasting Network. 2 Feb 1999. http://www.cbn.org/news/stories/y2k-basics.asp (10 Feb 1999)

[3]Capers Jones, *Possible Damages from the Year 2000 Problem,* SPR Inc., 15 December 1997, 4-12

Chapter 2

USAF Systems That Will Be Impacted

Just as computer systems are embedded in our major weapons systems, they are also embedded in our infrastructure. Biomedical systems, security sensors, automobiles, traffic lights, and our sophisticated heating and air-conditioning systems all rely on computer chips which can be impaired by this problem.

— Secretary of the Air Force Sheila E. Widnall
— Air Force Chief of Staff General Ronald R. Fogleman[1]

General Systems Used by the Air Force

Because computers permeate our modern life, many areas are being impacted by the Y2K problem. However, several vital areas, because of their dependency on computers, are more susceptible to the Y2K problem than others. Vital functions are those that, if lost, have the potential to cause a major disturbance in daily international and intranational operations. The key areas that may suffer the most due to the Y2K problem are air traffic control, financial institutions, water and electric companies, health care, personal computers, telephone systems, manufacturing, security systems and government services.[2] As you can see by this list the Y2K problem has the potential to directly impact every person and business in the United States in addition to a large part of the remaining world's population. Since Air Force personnel will be subjected to the same problems as the population-at-large, in addition to the problems created by Air Force

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specific systems, we can presume Y2K will impact USAF personnel to a similar, if not greater, degree than everyone else.

Air Force Specific Systems

The Air Force owns and operates many different systems that are dependent upon computers. Our airplanes, missiles, communications, intelligence and base infrastructure systems all require computers to operate. As a "push-button" air force we are even more dependent on computers than any of our sister services.

> The US Air Force's Air and Space missions are, arguably, the most technologically advanced and most technologically dependent missions in the world. We are now faced with the greatest challenge to those missions since the cold war – the potential widespread failure of our systems and equipment due to problems processing date information associated with the year 2000 (i.e., the Y2K problem).[3]

Some might argue that our systems are probably newer than those of other services and, thus, more likely to be Y2K compatible. While this is certainly true, there are still many systems in the Air Force dating back to the 1980's, 1970's and even the 1960's that were created before Y2K was ever considered. And it is these systems that are creating the most work and costing the most money for the Air Force.

According to Lt. Col. Scott Dufaud of the USAF Y2K Program Management Office, there are currently 3500 systems in the Air Force being tracked because of their potential to be impacted by Y2K. Of these 3500 systems, 420 are considered mission critical. (Mission critical systems are defined as systems whose "loss of these critical functions would cause immediate stoppage of direct mission support of wartime operations"[4].) These include aircraft such as the Joint Surveillance Target Attack Radar (JSTARS) and

the F-15 Eagle, weapons such as the Advance Medium Range Air-to-Air Missile (AMRAAM) and AIM-9 Sidewinder missile and various other systems like the Global Command and Control System (GCCS) and the Air Traffic Control System.

Obviously, the vast majority of Air Force systems are not considered level 1 mission critical. The remaining 3080 systems being tracked are considered mission essential (loss would eventually stop mission support of wartime operations), mission impaired (loss would affect, but not stop, mission support of wartime operations) or non-mission essential (loss would have no effect on direct mission support of wartime operations). Systems falling into these categories include such common-use systems as Military Leave Tracking, Time and Attendance Reporting and even Microsoft Office.

Current State of Air Force Systems

The USAF Y2K Program Management Office, a department of the Air Force Communication Agency (AFCA), has been tasked to track the status of our various systems and provide help to those agencies needing it. Because of the potential damage to national security if the status of our weapons systems were made public, the detailed reports on each of the systems are classified. However, some information regarding the systems is available for public consumption and it can give us an idea where the Air Force stands on correcting the Y2K problem.

The Air Force has experienced some difficulty meeting the 1 March 1999 Y2K compliance deadline laid down by the Office of Management and Budget (OMB)[5]. According to audit reports from the AFCA, as of 3 November 1998, only 20 of their 113 systems were Y2K compliant—less than a 20% success rate. Department of Defense base communication units identified 268 DoD components as non-compliant but, even

more distressing, they also stated that 131 of those components would not be compliant by the OMB March 1999 deadline. As of 5 October 1998 the Air Force Research Laboratory identified 12,100 systems and equipment compliant and 1000 non-compliant.[6]

Despite these numbers it looks as though virtually every system being tracked by the Air Force will meet the Y2K, if not the OMB, deadline. According to Lt. Col. Dufaud, "we don't expect any MC-1 systems to miss the rollover." He further states, "Almost all of the 3500 systems… have been or will be certified as Y2K compliant."   The Air Force's early efforts and desire to stay ahead of the power curve on this issue look to be paying off.

The problems created by the Y2K bug are also being tracked at command level. For example, according to General Lloyd "Fig" Newton, Air Education and Training Command Commander, AETC has been tracking three separate areas that are being impacted by Y2K: automated information systems, weapons systems and infrastructure.[7] According the General Newton, "Of the 123 AETC command-unique automated information systems, 61 are on the retirement list to be eliminated or replaced before the end of the year, 40 are certified as compliant, and 22 will be certified between now and April."[8]   General Newton goes on to state that AETC's weapons systems are either already YK compliant or they will be by 1 January 1999 and an independent contractor is presently assessing AETC's infrastructure. Initial reports indicate that approximately $10 million will be spent on command infrastructure problems.[9] Without a doubt, the impacts of Y2K are being felt at all levels.

As these numbers indicate, there is still much work to be done on Air Force systems. What they do not tell us, however, is how many systems will be compliant by 1 Jan 2000

and, of the ones that won't be, what impact we can expect. All outward appearances and

anecdotal evidence indicates that the major weapons, C4I, and infrastructure systems of

the Air Force will be tested and compliant. But there is little doubt that some of the less

visible systems will suffer.

Notes

[1] Sheila E. Widnall, Secretary of the Air Force, General Ronald R. Fogleman, Chief of Staff of the Air Force, *MEMORANDUM FOR ALMAJCOM-FOA, SUBJECT: Year 2000 Problem*, 24 June 1997

[2] Capers Jones, *Possible Damages from the Year 2000 Problem,* SPR Inc., (15 December 1997) 3-12

[3] *The Air Force Y2K Plan, Working Draft, "*Executive Summary", 27 Jul 98, v

[4] *The Air Force Y2K Plan, Working Draft, G.6,* "Mission Criticality Definitions", 27 Jul 98, 19

[5] US Office of Management and Budget, "4th Quarterly Report: Progress on Year 2000 Conversion". 15 Feb 1998. http://www.cio.gov/y2k4q.htm (15 Jan 1999)

[6] Audit report, "Compliance Certification", December 1998

[7] Lloyd Newton, "AETC Commander Asks Members to be Part of Y2K Solution", *Maxwell-Gunter Dispatch*, 5 March 1999, 2

[8] *Ibid*.

[9] *Ibid*.

Chapter 3

Impacts

I'm very confident we won't have major problems...In every case, the systems worked as designed.

—Deputy Defense Secretary John Hamre, commenting that the Pentagon will be ready for Year 2000[1]

Present Impacts of the Y2K Problem

No published expert on the Y2K problem seriously doubts that it will have at least a passing impact on his/her life. However, what most people don't realize are the effects the Y2K problem has already generated and the ones that will continue to manifest themselves regardless of whether or not the problem is fixed.

Beginning back in the late eighties the vanguard of the Y2K effort (Peter de Jager, author of <u>Managing 00</u>; Gerald Weinberg, winner of 1991 J.D. Warnier Prize for Excellence in Information Science) began to take steps to raise public awareness about Y2K and to correct the problem. This was the beginning of resource expenditures that have continued to grow each year at a near geometric progression. In a news article written for the <u>Washington Post,</u> 2 August 1998, Rajiv Chandrasekaran stated that he federal government was expecting to expend at least $5 billion to correct the Y2K bug. Four months later the Office of Management and Budget announced the government's cost to correct the Y2K problem at $6.4 billion.[2] And less than two months after that

David Walker, comptroller general of the United States, said the total estimated federal costs to be Y2K compliant is $7.2 billion. According to Walker, "There are too many uncertainties to determine whether this cost-escalation trend has ended."[3]

But the problem of mounting costs is not just in the United States. Later in his article Mr. Chandrasekaran stated that the worldwide bill for Y2K was expected to reach somewhere between $300 billion and $600 billion. Although he does not reference his source for these numbers it is widely accepted that those were the numbers used by industry analysts back in the 1996-1997 time frame. As early as March of 1998 analysts had revised their numbers up to $1 trillion for the worldwide effort.[4] To put this in perspective, the current projected expenditures on the Y2K problem will exceed the cost of the Persian Gulf War, the 1993 Midwest floods, the savings and loans bailout of the 1980s and the 1995 earthquake in Kobe, Japan.[5]

This high cost could have dire consequences for the Air Force and its many contractors. Ironically, the $1 trillion is only the expected up-front costs of Y2K. Some experts believe that the damages, recovery costs and lawsuits sure to be brought against various governments, corporations and individuals when their respective systems fail could go as high as $2 trillion dollars.[6] Because of the impact a large number of lawsuits would have on our court system and the effects, including bankruptcy, they would have on high-tech industries, the U. S. Senate is presently considering legislation to limit cap punitive damages in Y2K lawsuits.[7] In addition, three dozen states have either passed or are considering Y2K immunity legislation.[8] Considering the large number of high-tech firms with whom the Air Force contracts it is doubtful that they all would survive unscathed from the expected deluge of lawsuits unless protected by federal, state and/or

local legislation. Obviously, the Y2K problem is having and will continue to have a major impact on world commerce.

As far as the Air Force is concerned, the service is projected to expend $1.2 billion on correcting the Y2K problem, though this number might also go higher.[9] To put it in perspective, that is enough money to give every person in the active duty Air Force today a $3000 bonus. Obviously, whether or not the Air Force solves the problem it is still being considerably disrupted by Y2K.

Another area where the impact of Y2K has already been felt is that of personnel. Because of the President's Executive Order and the effort put forth by the services to solve the Y2K issue there has been a two-tiered impact on the communications-information personnel in the Air Force. Anecdotal evidence indicates many individuals with communications-information experience are virtually frozen in their current jobs because of their importance to solving the Y2K problem. Unfortunately, this prevents many of them from taking new jobs that are considered part of their career path and they lose the opportunity to develop the breadth the Air Force desires in its officers. On another level, frustrated at missing career enhancing opportunities and seeing a robust economy where people with programming skills can earn far more than their service pay, many of our best and brightest are opting to leave the military for civilian industry. The Air Force presently has only 63% of the captains and 75% of the majors it is authorized in the communications-information career field.[10] Personnel with experience working the Y2K problem can expect to make $75,000 per annum compared to an Air Force captain who makes about $45,000.[11]   And in industry they can continue to work the Y2K

problem for far more money without the extra responsibilities and duties that go along with being part of the military.

The Air Force has also been impacted by Y2K in the area of coding upgrades and breakthroughs. In their Memorandum for ALMAJCOM-FOA, 24 June 1997, then-Secretary of the Air Force, Sheila E. Widnall and then-Air Force Chief of Staff, Ronald R. Fogleman stated, "Effective immediately, all nonessential sustainment requirements and system enhancements will be deferred until after the system has been analyzed, fixed, and certified as Year 2000 compliant. We will use existing programmed resources to accomplish this. We realize this may mean deferring other fixes or modifications." As is made clear in the memo, many systems have not received the necessary attention or resource expenditures to keep them current because of the attention given to the Y2K problem. So, even when a program is not infected with the Y2K bug or has already had its software corrected it still is impacted by the Y2K problem and, by default, its users are too.

Impacts If Corrections Fail

Even if every system in the Air Force were tested for Y2K problems it would be a virtual certainty that some of the problems would escape notice. Capers Jones, chief scientist for Software Productivity research, Inc., and an expert on Y2K issues, states that over the last 13 years the software industry in the United States has been able to find and remove about 85% of software bugs during development and testing.[12] The actual range was from 50% to just over 99%, but certainly none of the products investigated had a 100% deficiency removal rate. If we extrapolate those numbers over mission-critical Air

Force systems then we can reasonably conclude that there will be problems of some type (failure, lock-up, faulty data, etc.) in some of the systems despite very rigorous testing.

Some of the difficulties we may experience are laid out in Table 1 below.[13]   And while this is by no means an exhaustive list of all the potential problems and/or impacts, it gives the reader a sense of the many varied areas that are affected by the Y2K problem.

Year 2000 Problem	Potential Impact
Invalid Date Calculations	Activities scheduled at specific intervals by the software will cease to be scheduled. Parts, which are not maintained or replaced on schedule may fail.
Invalid Date Comparisons	Items that have a short shelf life maynot be replaced when required.
Input screens accept only a 2-position year	Date may be misinterpreted.
Forms have space for only 2-position year	Date may be misinterpreted.
Reports display 2-digit date	Date may be misinterpreted.
Hardware cannot work beyond 12/31/99	Equipment for ordering parts, fuel, foodstuffs, etc. may not function. Automated alarm systems may not function.
Bar-coded dates have only 2-digit years	Some intervention needed to determine age of stock, expired stock, etc.
Specialized uses of dates	Permanent backups and databases may be deleted. Data integrity could be compromised.
Item is currently being re-engineered	Old system will require modification if re-engineering not completed before Year 2000.

2/29/00 not recognized as a valid date	Items will reject 2/29/00. Date discrepancy between items may cause interface problems.

<div align="center">

Table 1 Potential Date Problems

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Of the problems and potential impacts listed above the ones that pose the greatest threat to the USAF are hardware stoppage and the specialized use of dates. The problems generated by invalid date comparisons and calculations can be overcome with increased human intervention. Simply checking the stock on hand and processing the reorder forms instead of relying on computers will overcome many of these types of problems. However, the loss of the use of equipment, e.g. aircraft, or the failure of alarm systems have the potential of compromising the Air Force's ability to perform its primary mission until the problems are fixed. The loss of permanent backups and databases that could result due to the specialized use of dates would also have a severe impact on the way the Air Force conducts business. The loss of such information could cause entire systems to crash or, potentially worse, allow the systems to continue running but with corrupted data. If the Air Force can navigate these two major problems, most of its critical systems should operate properly.

Please note that the problems in Table 1 have the potential for creating both immediate and future difficulties. Immediate in the form of parts not being ordered or data being compromised. Futuristic problems that might result include needed parts not arriving and backup data, if needed, being unavailable. The Air Force will feel the impact of the immediate problems first but it can only be considered truly prepared if it can successfully anticipate the future problems.

Contingency planning is another area that must be considered in jeopardy. Despite the military's ability to plan for contingencies, Y2K presents several unique challenges. First, if there is a failure it will not be easy to pinpoint. It is just as likely that a system will fail due to infrastructure disruptions as it is that it will fail due to internal system problems.[14] Second, our traditional contingencies plans and back-up systems may be infected with the same faulty coding and have the same problems as the primary systems. If so, a completely different approach must be taken in order to accomplish the mission.[15] And third, if there are widespread problems, whether they are concerned with infrastructure, banking, security, etc., the normal course of action of our government is to call on the military to restore order and assist the nation. Unfortunately, in this case the military may be no better off than the civilian sector with the Y2K problem affecting military systems as well as military personnel being affected via the same systems impacting the civilian populace. To combat this latter hazard, the AFCA created and released a Y2K checklist for Air Force families (Appendix A) so they can minimize the impact of Y2K.

Notes

[1] "Pentagon Says It Will Be Ready for 2000". 18 Jan 1999 http://www.everything2000.com/news/computer/pentagonsaysready.asp 31 Jan 1999

[2] "Federal Y2K Costs Reach $6.4 Billion". 9 Dec 1998. http://www.techweb.com/wire/story/y2k/TWB19981012S0021 15 Dec 1999

[3] Mosquesa, Mary. "Top U.S. Auditor Says Y2K Readiness Lacking". 21 Jan 1999. http://www.techweb.com/wire/story/TWB19990121S0014 (31 Jan 1999)

[4] "Worldwide Price Tag for Compliance has Skyrocketed to $1 Trillion". TechWeb. 13 March 1998. http://www.oracle.com/year2000/fastfacts.html 14 March 1999

[5] Rajiv Chandrasekaran, Washington Post, 2 Aug 1998, A1

[6] Capers Jones, *Dangerous Dates for Software Applications*, 29 Jun 1998, 16

[7] Adam Entous, Reuters, *Senate Moves to Curb Y2K Lawsuits*, 4 March, 1999

[8] Montgomery Advertiser, *Limits on Y2K suits Considered*, 28 Feb 1999, 2J

[9] Scott Dufaud, USAF Y2K Program Management Office, 11 Mar 1999

Notes

[10]"33S Communications & Information Career Field Dynamics". 11 Dec 1998. http://www.afas.afpc.randolph.af.mil/com-comp/com-info.htm (15 Jan 1999)

[11] "DataMasters- 1999 Salary Survey". 12 Jan 1999. http://www.datamasters.com/survey.html (12 Mar 1999)

[12] Capers Jones, *The Aftermath of the Year 2000 Problem*, 17 Sep 1998

[13] The Air Force Y2K Plan, Working Draft, 27 Jul 1998, Appendix G, G.3.1

[14] *Draft DoD Year 2000 Management Plan, Ver. 2.0*, Dec 1998, H-1

[15] *US Air Force Year-2000 Continuity of Operations Planning Guide*, 6 Jul 1998, 6

Chapter 4

Y2K Correction Efforts

The bottom line is that the Air Force is going to be absolutely 100 percent mission ready on Jan. 1, 2000. We're going to take care of our people. We're going to be able to do the mission; everybody's going to get paid; the personnel system's going to work; and you'll be able to get medical care.

— Brigadier General Gary A. Ambrose, Director of the AF Y2K Office[1]

On 4 Feb 1998, President Clinton signed the "Year 2000 Conversion" Executive Order which, among other things, tasked the various governmental agencies to locate the Y2K problems in their respective computer systems, correct the problems and test the systems for compliance. "The American people expect reliable service from their government and deserve the confidence that critical government functions dependent on electronic systems will be performed accurately and in a timely manner."[2] HQ AFCA is the designated focal point for Year 2000 resolution efforts throughout the Air Force. They are tasked to develop internet resources to "spread the word" and evaluate Air Force applications in order to be able to describe the scope of the problem and the anticipated costs required to resolve Air Force Y2K issues.[3] According to the AFCA, "The Y2K problem is not just a 'Comm & Info problem' – it is a mission problem!! The Wing Commander has the greatest stake in the Y2K problem. His command and control functions may fail. His aircraft may not fly. His munitions may not arm."[4]

Created in 1995 the Air Force's Y2K Program Management Office is tasked, "To provide an Air Force-wide coordinated effort that ensures no mission's critical system is adversely effected by the Year 2000."[5] It has spent the last 4 years promoting awareness, developing plans, advising commands, tracking Air Force efforts for combat the Y2K problem.

In addition to the Air Force effort, each of our sister services and other DoD agencies has responded to the president's executive order by creating focal points of their own. All of these various working groups fall under the auspices of the DoD Y2K Steering Committee headed by the Deputy Secretary of Defense. This oversight is critical for national defense because as we've moved closer and closer to "jointness" in the military our systems have had to work closer and closer also. We are now at the point where if one system generates faulty data or fails to work the repercussions are felt through many different systems and impact many different missions. Fortunately, the DoD steering Committee, via their DoD Year 2000 Management Plan, stated that "mission critical systems shall receive priority for Y2K repair, testing, certification and replacement. Mission Critical Systems are those… identified by the CinCs which, if not functional, would preclude the CinC from conducting missions across the full spectrum of operations."[6] Thus, the majority of the billions of dollars and millions of man-hours spent by the DoD on Y2k are going to fix the mission critical systems first before inspecting and correcting the secondary systems.

Additionally, DoD is committed to "continued national security through the effective integration of DoD Y2K activities with domestic and foreign partners" via the DoD Outreach Program outlined in Appendix M of the DoD Y2K Management Plan.[7] Through

this program the DoD plans to prevent the disruption of any critical Federal program due to Y2K, as well as facilitate the exchange of information and data concerning the Y2K problem among federal, state and local governments.[8]   The Outreach program is also responsible for reassuring "the American people, allies, friendly nations, and potential adversaries that DoD remains capable of executing the National Military Strategy."[9]

In order to achieve these goals, the DoD's Y2K Conversion Council has adopted a five-phase management process to identify, track and correct Y2K problems in critical systems. The five phases are 1) Awareness: learn about the Y2K problem and how it affects information technology 2) Assessment: Are systems Y2K compliant? If not, terminate, replace, or renovate 3) Renovation: Make system Y2K compliant 4) Validation: Test system on a compliant domain and in a compliant environment (this is the long pole in the tent) and 5) Implementation: Install renovated and validated system at all operational sites.[10]   These efforts are expected to greatly diminish the impacts the Y2K problem will have on the DoD establishment.

Notes

[1] Brandon, Linda. "Air Force Ready for Millennium Bug", *Air Force Print News*. 25 Feb 1999.
http://www.af.mil/cgibin/multigate/retrieve?u=z3950r://dtics11:1024/airforce!F10924%3a921432596%3a%28y2k%29;esn=FT%5fTEXT%20HTML%200;ct=text/html   (5   Mar 1999)
[2] The Air Force Y2K Plan, 3
[3] "The Gameplan", Y2K Issue, *AFCA Homepage*,
http://www.afca.scott.af.mil/pa/y2k/isswrld.htm (14 Dec 1998)
[4] Executive Summary, v
[5] "Air   Force   Corporate   Approach",   Y2K   Issue,   *AFCA   Homepage*,
http://www.afca.scott.af.mil/pa/y2k/isswrld.htm (14 Dec 1998)
[6] *Draft DoD Year 2000 Management Plan*, Ver. 2.0, December 1998, 2
[7] *Ibid*. Appendix M, 2
[8] *Ibid*.
[9] *Ibid*., 3

Notes

[10] *Draft DoD Year 2000 Management Plan*, Ver. 2.0, December 1998, Appendix A, A-1

Chapter 5

Additional Concerns

Dates Other Than Y2K That May Create Problems

Although 1 January 2000 will have the most far-reaching effects on computer programs, there are several other dates in the very near future that may create almost as much confusion and hardship. On 21/22 August of 1999 the Global Positioning Satellites will reset their week counter from 1023 to 0000 for the first time since 1980.[1] Although these systems have been and are presently being tested, the possibility certainly exists for software errors to cause problems with either global navigation or international commerce that uses the GPS for calculations concerning international money transfers.[2]

Another date that may cause confusion is that of 9 September 1999. Some computer programmers use all 9's to indicate an end of file. If computer programs interpret 9 September 1999 as 9999 they may react in completely unintended and unpredictable manner.[3]

The final near-term problem date, aside from 1 January 2000, is 29 February 2000. Under the rules of leap years, years ending in "00" are not a leap year unless the total year is evenly divisible by 400. For example, 1900 was not be a leap year because it ends in "00" but, even though it also ends in "00", 2000 will be a leap year because it is evenly divisible by 400. Because of this exception to the way leap years are calculated it

remains to be seen how many programs navigate the leap day correctly. Normal computing procedures for missing a leap year are either doing calculations twice or shutting down the application.[4]

Embedded Chips

Probably the most difficult area of the Y2K problem to validate and test is that of embedded computer chips. Embedded chips are computer microprocessors that perform a specific function based upon their configuration and software and are resident in many daily use items. The chips are in such things as car engines, hospital equipment, and telephone switches.[5] Because they are present in so many systems and the majority of those systems will not be tested or validated it is virtually assured that some of those systems will fail. Fortunately, most of the embedded chips are not date dependent and Y2K will go unnoticed by them.[6] But, for the ones that process dates the results are unpredictable. The Y2K problem could result in complete failure or, possibly, in a temporary failure that can be corrected by simply changing the internal computer clock. In most cases we won't know until 1 January 2000.

Y2K Problems in Other Nations

According to the Senate report on Y2K released 2 March 1999 the international sector is cause for major concern. Many of the United State's trading partners are far behind on their Y2K effort.[7] Our three largest trading partners, Canada, Japan and Mexico fall well behind the U. S. in preparation for Y2K. And Venezuela, our largest supplier or imported oil, is 9-15 months behind the U. S. in its Y2K efforts.[8] Besides the disruption in manufacturing and commerce this may cause one area the military must be

concerned with is that involving developing nations. Nations whose economies are still

in their infant stages can ill-afford any setback at all. Unfortunately, the Y2K problem

may very well disrupt global commerce all the way down to the agrarian level. Should

that happen there would almost certainly be civil unrest in some developing countries.

Historically, when that happens the military is called upon to execute any of a variety of

deliberate plans, from Non-Combatant Evacuation Operations to Peacemaking to

Peacekeeping. Even if the Y2K problems experienced by the United States turn out to be

minor, the military must stand ready to react globally.

Notes

[1] Capers Jones, *Dangerous Dates for Software Applications*, Version 4, 29 June 1998, 8

[2] *Ibid*

[3] *Ibid*., 9

[4] *Ibid*.

[5] Hayes, Heather. "Y2K Planners Troubleshoot The Civic Safety Net", 15 January 1999. http://cnn.com/TECH/computing/9901/15/civic.y2k.idg (31 Jan 1999)

[6] Bettinger, Dave. "Embedded Chips: Dispelling Some Myths". 5 Nov 1998 http://www.y2k.journal.com/issues/issue_9/bettinger.htm (13 Dec 1999)

[7] "Senate Special Committee on the Year 2000 Technology Problem", 2 Mar 1999. http://www.cnn.com/ALLPOLITICS/stories/1999/03/02/y2k.report (7 Mar 1999), 145

[8] *Ibid*.

Chapter 6

Conclusion

The worldwide effort to correct the Y2k problem may very well be the largest technological effort, in terms of money and manpower, in the history of civilization—surpassing even WWII[1]. With more than $1 trillion being spent on correction efforts, its costs easily exceed the annual budget of every country save the United States. Yet for all the money and manpower thrown at the problem it is a virtual certainty that some computers and the systems they direct will cease to function properly on 1 January 2000. Since this is a problem that will arrive on a fixed and hard date, prior planning and early intervention are the keys to navigating it successfully. Fortunately, the US Air Force has taken a proactive stance on the issue of Y2K and has been working the problem for more than four years. Because of its aggressive working of the Y2K issue, the USAF will have all of its mission critical systems and most, if not all, of its other systems tested, validated and fielded by the end of 1999.

Where the Air Force may run into difficulties is in the area of general-use systems, especially ones that it does not control. Civilian-run systems such as water, power and traffic may suffer setbacks and any problems they generate will most assuredly impact local military personnel and, by definition, military operations. However, most experts

believe that the majority of problems that occur in the United States will last no more than 72 hours[2]. At that point it should be back to business as usual.

On the international front, however, there is far more doubt as to whether or not many countries and businesses will be ready for Y2K. Should there be widespread failures due to Y2K the Air Force expect to be called upon to help wherever the administration and the State Department send them. Their roles could range from moving critical supplies to aiding with evacuations of American citizens to providing peacekeeping operations for a shaky foreign government. But whatever the role, the Air Force will be ready to respond when called upon.

As the months have passed, the predictions for Y2K in the major newsmagazines and newspapers have gotten less and less dire. This is not because the problem is any less real but rather because government and business agencies have taken it seriously and devoted the necessary time and resources to solving it. The USAF will weather this storm as it has so many others—with the right mix of foresight, effort and expertise.

Notes

[1] "The Basics of Y2K." The Christian Science Broadcasting Network. 2 Feb 1999. http://www.cbn.org/news/stories/y2k-basics.asp (10 Mar 1999)
[2] "Senate Special Committee on the Year 2000 Technology Problem", 2 Mar 1999. http://www.cnn.com/ALLPOLITICS/stories/1999/03/02/y2k.report (7 Mar 1999), 145

Appendix A

Year 2000 Home Preparation Checklist for Air Force Families

By now, you have no doubt heard of the Year 2000 problem, also referred to as Y2K. The trouble is, you may have heard anything from, "Don't worry, be happy," to "It's the end of the world as we know it." The grim outlook often put forth by the media can usually be traced back to the year 2000 vendors or consultants who have a vested interest in feeding the hysteria. So, beware of unqualified advice, the sky is not falling.

The truth is most experts expect there will be some isolated, short-term problems that occur. However, these should be remedied quickly because government and industry are working very hard to ensure we are prepared for the calendar change and can handle any subsequent problems. That's not to say you shouldn't be ready for these problems in case you're among those effected. This checklist was created with that in mind. The Air Force Communications Agency (AFCA) believes a little preparation, as outlined herein, should ensure our Air Force families are minimally affected by the Y2K problem.

This information is provided to assist Air Force families in assessing and preparing for the possibility of various failures associated with Y2K. While most homes will continue to operate normally in the year 2000, some products and services we rely on may not. Certain industries such as banking, power, gas, water, and telecommunications

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industries may experience short term-failures. Preparing for the possibility of these failures just makes good sense.

What is Y2K?

Cost and space limitations in computer memory chips led programmers to use only the last two digits to designate the year. Many computer chips maintain time and date information in different locations—the first two digits (century) are hard coded into the chip and the last two digits count from"00" to"99". The two locations are put together to for the four digit year, i.e., 1999. Problem solved—at least until the year 2000.

The Y2K problem will occur when "99" rolls over to "00" and programs misinterpret the year as 1900 instead of 2000. As if that isn't enough, the year 2000 is also a leap year. So, programs may not recognize 2/29/2000 or the fact that 2000 will have 366 days instead of the usual 365. With the evolution of computer technology, the use of two digits to represent the year occurs in many of our modern conveniences—PCs, VCRs, TVs, cameras, camcorders, fax machines, electronic organizers, and even cars! Just about anything that recognizes, processes, or manipulates dates is susceptible.

What You Should Do

The first step in assessing your Y2K susceptibility is to inventory those items that use date information. Remember any product that processes date information could be affected.

Equipped with your inventory, determine if having these items recognize the correct date is important. If so, there are simple tests you can do to see if these items are Y2K compliant. For example, set the clocks on these devices to 11:58 p.m. on 12/31/99 (1999) and see what happens after two minutes. If you see 1/1/00 (2000), then it is Y2K

compliant. If the device displays the day, it should show 1/1/00 (2000) as a Saturday. You may also want to test for leap year compliance. Set the clock forward to 2/29/00 (2000) and see if it recognizes 2/29/00 (2000). If you have computer access, check the manufacturer's Website for information regarding compliance and workarounds for non-compliant products.

For PCs, there are free tests available to check the compliance of your PC Basic Input/Output System (BIOS). Beware of doing manual testing on your home PCs. There are several dangers to manual testing--- software licenses may expire, or date sensitive software may delete or archive current data. The Holmesfx Website contains a good description of the problem as well as test and fix information. Here are several public commercial sites that provide BIOS tests.[1]

Holmesfx

wsnet.com/~designer/holmesfx/

OnMark 2000 BIOS Test

onmark.viasoft.com

Ymark2000

www.nstl.com/html/nstl_y2k.html

Fernlink 2000

www.implement.co.uk/bios.htm

Most non-compliant PCs can be fixed with software patches or by manually setting the date on Jan. 1, 2000.

Check with the manufacturers of frequently used software programs such as Microsoft, Lotus, and Corel. Here is a list of manufacturer Websites with compliance information (see footnote).

Microsoft Corporation

www.microsoft.com/technet/year2k

Corel Corporation

www.corel.com/2000.htm

Lotus Development Corporation

www.lotus.com/solutions/knwledge.nsf/content/y2khomepage?opendocument

Intuit Inc. (Quicken)

www.intuit.com/support/year2000.html

Another area of concern may be home medical devices. If necessary, ask your physician if your device processes date information. If so, be sure to check with the manufacturer for compliance information. Also, you may want to refill necessary medical prescriptions.

Be Prepared

By anticipating some of the problems that may occur due to the millennium change, making preparations will reduce your risks. The following checklist is not all-inclusive but will direct your attention towards some precautionary measures that may lessen your risks as the millennium rollover approaches.

- Beginning January 1999, keep paper records of all back, credit card, and loan statements including Individual retirement Accounts, Certificates of Deposit, 401K accounts, and mortgage papers.

- Secure adequate cash supply for you short-term needs (enough for a 3-4 day weekend.

- Temporarily, gas pumps may experience some failure so ensure automobiles have full tanks

- Check your emergency kits. The kits you have for storms and/or natural disasters should be sufficient in the event of temporary loss of utilities

Again, this checklist was created to prepare you for the possibility of short-term failures. We are working hard to ensure the year 2000 rollover comes and goes without any adverse effect to your daily lives. However, some simple, smart preparations as well as good common sense will make the transition easier and get you through any temporary failures. There's no need to seek the advice of experts so be cautious of unqualified advice and/or fraudulent claims offering to help you "survive" the Y2K rollover.

This checklist is posted on the AFCA's Y2K Comm & Info Website.

For more information regarding Y2K, contact:

HQ AFCA/TCAA
203 W. Losey St. Room 2000
Scott AFB IL   62225-5222
(618) 256-3979, DSN 576-3979

E-mail: afca-tcca@scott.af.mil

Notes

[1] These are just a few of the possible sites available. The Air Force does not endorse any particular, nor is it responsible for, individual site content.

Bibliography

"Air Force Corporate Approach", Y2K Issue, *AFCA Homepage*. Online. Internet. Available from http://www.afca.scott.af.mil/pa/y2k/isswrld.htm 14 Dec 1998

The Air Force Y2K Plan, Working Draft, 27 Jul 98

"The Basics of Y2K." *The Christian Science Broadcasting Network*. Online. Internet, 2 Feb 1999. Available from http://www.cbn.org/news/stories/y2k-basics.asp 10 Feb 1999

Bettinger, Dave. "Embedded Chips: Dispelling Some Myths". 5 Nov 1998. Online. Internet. Available from http://www.y2k.journal.com/issues/issue_9/bettinger.htm 13 Dec 1999

Brandon, Linda. "Air Force Ready for Millennium Bug", *Air Force Print News.* 25 Feb Online. Internet. Available from http://www.af.mil/cgi-bin/multigate/retrieve?u=z3950r://dtics11:1024/airforce!F10924%3a921432596%3a%28y2k%29;esn=FT%5fTEXT%20HTML%200;ct=text/html 5 Mar 1999

"Compliance Certification", Air Force Y2K Program Management Office. Audit report. December 1998

Cowles, Rick *Electric Utilities and Y2K*. Penns Grove, New Jersey EUY2K, 1998 "DataMasters- 1999 Salary Survey". 12 Jan 1999. Online. Internet. Available from http://www.datamasters.com/survey.html 12 Mar 1999

Draft DoD Year 2000 Management Plan, Ver. 2.0, Dec 1998

Dufaud, Scott, USAF Y2K Program Management Office, Email. 11 Mar 1999

Entous, Adam. Reuters, *Senate Moves to Curb Y2K Lawsuits*, 4 March, 1999

"Federal Y2K Costs Reach $6.4 Billion". 9 Dec 1998. Online. Internet. Available from http://www.techweb.com/wire/story/y2k/TWB19981012S0021 15 Dec 1999

Fogleman, General Ronald R., SecAF Sheila E. Widnall. Memorandum. To ALMAJCOM-FOA. SUBJECT: Year 2000 Problem, 24 June 1997

"4th Quarterly Report: Progress on Year 2000 Conversion". US Office of Management and Budget 15 Feb 1998. Online. Internet. Available from http://www.cio.gov/y2k4q.htm 15 Jan 1999

"The Gameplan", Y2K Issue, *AFCA Homepage*. Online. Internet. Available from http://www.afca.scott.af.mil/pa/y2k/isswrld.htm 14 Dec 1998

Hayes, Heather. "Y2K Planners Troubleshoot The Civic Safety Net", 15 January 1999. Online. Internet. Available from http://cnn.com/TECH/computing/9901/15/civic.y2k.idg 31 Jan 199

Hyatt, Michael S. *The Millennium Bug: How to Survive the Coming Chaos*. Washington, D.C., Regnery Publishing, 1998

Jones, Capers. *The Aftermath of the Year 2000 Problem*, SPR Inc., 17 Sep 1998

Jones, Capers. *Dangerous Dates for Software Applications*, SPR Inc., 29 Jun 1998

Jones, Capers. *Possible Damages from the Year 2000 Problem,* SPR Inc., 15 December 1997

Maxwell-Gunter Dispatch, 5 March 1999

Montgomery Advertiser, 28 Feb 1999

Mosquesa, Mary. "Top U.S. Auditor Says Y2K Readiness Lacking". 21 Jan 1999. Online. Internet. Available from http://www.techweb.com/wire/story/TWB19990121S0014

"Pentagon Says It Will Be Ready for 2000". 18 Jan 1999. Online. Internet. Available from http://www.everything2000.com/news/computer/pentagonsaysready.asp 31 Jan 1999

"Senate Special Committee on the Year 2000 Technology Problem", 2 Mar 1999. Online. Internet. Available from http://www.cnn.com/ALLPOLITICS/stories/1999/03/02/y2k.report 7 Mar 1999

"33S Communications & Information Career Field Dynamics". 11 Dec 1998. Online. Internet. Available from http://www.afas.afpc.randolph.af.mil/com-comp/com-info.htm 15 Jan 1999

US Air Force Year-2000 Continuity of Operations Planning Guide, 6 Jul 1998, 6 *Washington Post*, 2 Aug 1998

"Worldwide Price Tag for Compliance has Skyrocketed to $1 Trillion". *TechWeb*. 13 March 1998. Online. Internet. Available from http://www.oracle.com/year2000/fastfacts.html 14 March 1999